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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/870,242	05/30/2001	Jitendra Singh Goela	51048-2 DIV (3568-33-000)	9573

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EXAMINER	
EGAN, BRIAN P	

ART UNIT	PAPER NUMBER
1772	12

DATE MAILED: 02/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/870,242	GOELA ET AL.1	
	Examiner	Art Unit	
	Brian P. Egan	1772	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *27-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *27-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Interpretation

1. The Examiner notes that the limitation "chemical vapor deposited" is given little to no patentable weight. Chemical vapor deposition is a process of forming a device and not germane to the patentability of the article itself.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 27-29 and 34 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Suda et al. (#5,783,255).

Suda et al. disclose a hollow chemical vapor deposited monolithic silicon carbide (see Abstract; Col. 3, lines 55-67) shell having an aspect ratio of 150 (Col. 6, lines 33-35). The CVD silicon carbide shell can be both cylindrical (Col. 6, lines 33-55) and frustroconical ("dome-shaped" – Col. 5, lines 22-25). It is noted that although Suda et al. teach a CVD formation process, such disclosure is not necessary to anticipate the Applicant's claimed invention.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suda et al. (#5,783,255).

Suda et al. teach a hollow CVD monolithic silicon carbide shell as detailed above. Although Suda et al. teach an example of a cylindrical SiC shell with a diameter of 150mm (which correlates to an external perimeter of 18.5 inches), Suda et al. fail to explicitly teach that the external perimeter of the article can be increased to exceed 65 inches and that the aspect ratio can exceed 200. Such modifications, however, would have involved a mere change in size. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955). Despite the Applicant's contentions that prior art SiC shells could not be made at large diameters since cracking occurs, Suda et al. explicitly teach the use of a carbon composite substrate that the SiC shell is formed upon using CVD wherein the carbon composite is specifically formed to exhibit a thermal expansion equivalent to that of the desired end product formed upon the composite to prevent cracking and deformation (Col. 4, lines 15-23). Therefore, it would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to have formed a SiC shell with a perimeter in excess of 65 inches and an aspect ratio of 200 or greater by forming the carbon composite such that it exhibits

a thermal expansion equivalent to a SiC shell with a perimeter in excess of 65 inches with an aspect ratio of 200 or greater.

6. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suda et al. (#5,783,255) in view of Sibley (#5,776,391).

Suda et al. teach a silicon carbide shell as detailed above. Although Suda et al. discloses a dense silicon carbide (Col. 4, line 1-5), Suda et al. fail to explicitly state that the density is at least 3.15 grams per cubic centimeter.

Sibley, however, teaches the use of full density silicon carbide shells. Sibley teaches a silicone carbide density of at least 3.18 grams per cubic centimeter (Col. 8, lines 1-2). Sibley teaches the use of a full density silicon carbide for the purpose of providing an advantageous structure where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process (see Abstract). It would have been obvious through routine experimentation to one of ordinary skill in the art at the time applicants invention was made to have provided a full density silicone carbide material for the purpose of providing an advantageous structure where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process as taught by Sibley.

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicants invention was made to have modified Suda et al. to include full density silicon carbide in the silicone carbide shell as taught by Sibley in order to provide an advantageous structure

where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process.

7. Claims 27-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reagan et al. (#5,154,862) in view of Sibley (#5,443,649) and Caputo et al. (#4,895,108).

Reagan et al. teach a hollow chemical vapor deposited monolithic silicon carbide shell (see Abstract). Reagan et al. teach that the shell may be any complex shape ("irregularly shaped articles" – Col. 6, lines 9-14; "tube" – Fig. 2, #60) and thus teaches both cylinders and frustroconically shaped articles. Reagan et al. further teach that codeposited articles produced by the method of the invention amy also have enhanced fracture resistance without any degradation of strength (Col. 7, lines 65-68). Although Reagan et al. fail to explicitly teach a specific aspect ratio or external perimeter, Reagan et al. teach that any desired shape may be produced. Therefore, it would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to have adjusted the wall thickness as well as the diameter of the silicone carbide shell depending on the desired end product. Furthermore, it would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to have modified the wall thickness and diameter of the silicone carbide shell since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art, *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980), and a change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955). Reagan et al. also teach that an annular layer of felt or other flexible material may be included between the mandrel and the carbon paper tube to help maintain desired dimensional restrictions and to facilitate removal of the composite article from the reactor (Col. 4, lines 35-

40) and that after codeposition is complete, the tube and composite articles may readily be separated from the mandrel by removing the end cap and sliding the tube along the mandrel – if removal of one or both layers of the carbon tube is also desired, it may then be burned or sand-blasted away from the composite article (Col. 5, lines 35-41). Therefore, Reagan et al. teach away from the buildup of silicone carbide on the CVD apparatus which the Applicant claims to preclude formation of large shells because the buildup causes cracking in the shell. Thus, the ability to modify the size and wall thickness of Reagan et al. would not be precluded from any unexpected results obtained by the Applicant's CVD process.

Reagan et al. fail to explicitly teach the density of the silicone carbide shell.

Sibley, however, teaches the use of full density silicon carbide shells. Sibley teaches a silicone carbide density of at least 3.18 grams per cubic centimeter (Col. 8, lines 1-2). Sibley teaches the use of a full density silicon carbide for the purpose of providing an advantageous structure where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process (see Abstract). It would have been obvious through routine experimentation to one of ordinary skill in the art at the time applicants invention was made to have provided a full density silicone carbide material for the purpose of providing an advantageous structure where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process as taught by Sibley.

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicants invention was made to have modified Reagan et al. to include full density silicon

carbide in the silicone carbide shell as taught by Sibley in order to provide an advantageous structure where high temperatures and/or corrosive chemicals are present wherein the structure provides high dimensional stability as well as prevents contaminating elements from affecting the process.

Finally, even if the Applicant contends that the CVD process of Reagan et al. is precluded from forming large sized shells with large aspect ratios based on buildup of silicone carbide that causes cracking, both Sibley and Caputo et al. teach CVD processes that form silicone carbide articles wherein specific process steps would preclude buildup of silicone from causing cracks as posited by the Applicant. For example, Sibley teaches that after chemical vapor deposition of the silicone carbide upon a graphite substrate, the substrate may be removed by burning, machining, grinding, grindblasting, and/or dissolving, and that the silicone carbide may be grinded in any areas where more precise dimension is required (see Abstract). Caputo et al. teaches a process step of coating silicone carbide with a coating layer of pyrolytic carbon that enhances the ability of the shell to be removed from the graphite substrate and prevents cracking ("brittle fracture" – Col. 6, lines 19-28). Therefore, Teverovsky et al. may be modified to include any of these aforementioned process steps depending on the desired end product. Thus, for example, Teverovsky et al. may dissolve away the graphite substrate and further grind down the silicone carbide shell such that any buildup would not affect and/or cause cracking in the substrate when forming silicone carbide shells with perimeters greater than 65 inches and aspect ratios exceeding 200.

Response to Arguments

8. The Examiner has withdrawn the rejection from the previous office action with regards to the teachings of Teverovsky et al. (#5,443,649). The Examiner agrees with the Applicant's contention that the reference does not qualify as prior art.

9. Applicant's arguments filed 11/14/03 with regards to the teachings of Reagan et al. ('862) have been fully considered but they are not persuasive. The Applicant's primary contention is that Reagan et al. fail to teach a monolithic silicon carbide shell and instead teach a two-phased silicon carbide composite shell. Although the Applicant looks to their specification on page 3, line 9 for support of the term "monolithic," nowhere does it state that "monolithic" is to be defined as meaning a shell comprising only silicone carbide that has been deposited by CVD. To the contrary, the Examiner has defined "monolithic" in its broadest possible meaning as "solid and uniform" (see *Websters II New Riverside University Dictionary*). Whether the SiC shell is formed by a dual process is immaterial and the limitation that the shell is chemical vapor deposited is given little to no patentable weight since it is not germane to the patentability of the article itself. Insofar as the end product of a prior art reference is "solid and uniform," the Applicant's claimed structure is anticipated. The Examiner agrees that Reagan et al. teach a two phase process involving the mixing of solid SiC particle into the CVD gas stream but the end product is "a codeposited composite tube having silicon carbide particles randomly and uniformly distributed throughout the silicon carbide matrix." (Col. 3, lines 4-8). Thus, the end product of Reagan is a solid and uniform SiC substrate and is therefore defined by the Examiner as monolithic.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian P. Egan whose telephone number is 571-272-1491. The examiner can normally be reached on M-F, 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Y. Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BPE 2/3/04

HAROLD PYON
SUPERVISORY PATENT EXAMINER
1772

2/5/04